in southern California, which probably did considerable damage to drying fruit and beans in that section. This storm moved rapidly north from the Gulf of California and rain had begun in the extreme south before warnings were issued.

A warm wave covered California from the 25th to the 29th and on the 26th at San Luis Obispo the record for

high temperature in September was broken.

Frost warnings were issued on the 10th, 12th, 13th, 16th, and 20th in the Plateau region, and by the close of the month most of the stations in that section had either reported killing frosts or asked that frost warnings cease for the season.

Storm warnings were issued as follows: On the 20th, southwest warnings, mouth of Columbia River and Washington stations; 23d and 25th, southwest warnings at all Oregon and Washington stations; 27th, southwest warnings at the mouth of the Columbia River and Washington stations; 28th, northwest warnings at Eureka, Mendocino, and Fort Bragg. Advisory warnings were sent to all Washington and Oregon stations on the 23d; and small craft warnings were ordered at Eureka, Mendocino, and Fort Bragg on the 28th.

The following rain warnings were issued for the benefit of fruit driers: 1st, northern California; 3d, central coast and San Francisco Bay sections; 13th, San Francisco Bay section and Sacramento Valley; 17th, northern California, and 30th, California.—G. H. Willson.

627-4/(73) RIVERS AND FLOODS.

By H. C. FRANKENFIELD, Meteorologist.

#### THE TEXAS FLOODS.

Torrential rains on September 9 and 10 caused general floods in the rivers of central and southern Texas. Over the drainage area of the San Antonio River, and thence northeastward through Williamson and Milan Counties into Bell County, the rain was excessive in amount and

apparently unprecedented in rate of fall.

The rains were caused by a storm of tropical character that apparently moved inland, and to the north-north-eastward, south of Tampico, Mexico, on September 7. Barometric evidence as to its movement subsequent to September 7 is lacking, but the times of beginning of heavy rains, as noted in the next paragraph, indicate the progression northeastward of an atmospheric disturbance the nature of which can not be definitely stated. At 8 a m., September 8, a 24-hour rainfall of 6 inches was reported at Laredo, Webb County, Tex., on the Rio Grande. At 8 a. m., September 9, 4.05 inches was reported at Encinal, La Salle County, about 40 miles north of Laredo; and at 8 a. m., September 9, 5.70 inches at Hondo, Medina County, about 85 miles north of Encinal. These rains indicated a slow yet apparently steady northward movement of the excessive rain. The floods in the larger rivers were not severe except over the middle and lower Brazos drainage areas.

The following table shows the amount of rainfall from all available places of observation. Some of the reports in the San Antonio district were not official, and at 13 of the stations improvised gages, such as cans and barrels, were used. These latter were afterwards visited and the measurements carefully checked. This table was prepared by Mr. B. Bunnemeyer, in charge of the Weather Bureau office at Houston, Tex. The data for the outlying points near San Antonio are not included in Table I, but are shown in the table immediately following. Their positions may be identified by the corresponding numbers on the chart accompanying the San Antonio report. (See p. 495, this Review.)

TABLE 1.—Rainfall reported September 7 to 11, 1921, arranged by drainage basins.

### 1. RIO GRANDE DRAINAGE.

Station.	County.	Sept.	Scpt.	Sept.	Sept.	Sept.	Total
		7.	8.	ý. 	10.	11.	1 0684
stownsville	Cameron	1.07	0,68	1.18			2. 9
Eagle Pass	Maverick		0.07	0.05			0.1
ort Clark	Kinney		0.28		<b>-</b>		6, 2
aredo	WebbCameron	0.20	6.00	-5-14-			6. 20 2. 83
Mission	Hidalgo	0.42	0.12	2.14			0.5
Rio Grande	Starr		0.15	1		l	0.1
an Benito	Cameron		0.13	0, 78			1.8
	2. NUECES DRA	INA	ЭE.				
Big Wells	Dimmit	 	0.23	1.39	0.02	<b> </b>	1.0
Dilley Encinal	Frio La Salle	i	0.06	1.62 4.05	1.81		3.4
leorge West	Live Oak	0.22	2. 45	5. 55	0.10	ļ	
Hondo	Medina	i		0.65	5. 70	1	6.3
La Pryor	Zavalla	·	0.80	0.02		0.02	0.8
Mathis Montell	San Patricio	1.53	1.81	0.24	T.	0.04	3.5
Pearsall	Uvalde	10,00	0.59 1.35	1, 47			
Rossville	Atascosa	0.02	0.13	1.16			1.3
abinal	Uvalde	0.11	0.19	1.36			
Whitsett	Frio. Atascosa Uvaldo. Live Oak		1.37	5. 45		-	6.8
	3. SAN ANTONIO	DRAI	NAGE	;			
Boerne	Kendall. Goliad. Karnes. do. Bexar.	0 50	0. 23	6. 45	0.04	0, 36	6.7
vollad	Kornes	. v. 56	0.49	2. 20 4. 51	0.03		1 7 6
Rungo	do	1	0.81	2.65			3.4
an Antonio	Bexar.		0. 54	6. 84	T.	ļ	7.3
	4. GUADALUPE I	RAIN	AGE.		·	.!	<del>'</del>
Blanco	Blanco	0.18	0.15	1, 72	5. 80		7.8
Cuero	Blanco De Witt	0. 22	1.37	0.46	1		. 2.0
Gonzales	Gonzales		. 0. 12	1.63	1.24		.1 2,9
Kerrville	Gonzales Kerr Caldwell	0.02	0.01	0. 26	2.87	0.04	
Luling New Braunfels	Caldwell		0.08	1.50 9.38	0.90		9.5
New Braunier	Comal Hays		2.00		1.50		11.5
San Marcos Victoria	Victoria	0. 75	0.65	1.02			2.4
· · · · · · · · · · · · · · · · · · ·		<u> </u>	<u> </u>	1		1	
	5. COLORADO DI	T	T	1	Ţ	Т	
Austin	Travis		0.05		4.03	T.	19.2
Columbus	Colorado		0.14	2.00 3.40		T.	2. 4 8. 7
Fairland		0.02	0.49		0.09	1	.  î.i
La Grange	Llano	1	}	0.14	1.65		l î.;
Marble Falls	Rurnett	. T.	0.57	5, 50	11.00	1	17.0
Morris Ranch	Gillespie		. 0.02	5. 50 1. 24 T.	0.24	0.01	1.6
Pierce	Gillespie	. 0.92	3.85	T.	0.06		4.8
Smithville	Bastrop	0.58	0. 28	1.16	1.36		3.8
	6. BRAZOS DR.	AINA	E.			ľ	4
Brazoria	Brazoria	0.83	0.88	0.96		0.34	8.1
Brenham		i m	0.01	2 14	0.13	0.04	
Campron	Milam	T. 0.30	0.01	2.14 0.85	0. 13 0. 23 12. 45	0.04	14.8
Cameron		0.30 T.	0.01 0.77 0.22	2. 14 0. 85 1. 12	0. 23 0. 23 12. 45 0. 07	0.01	2.3 14.3 1.4
College Station	Brazos	0.30 T.	0. 01 0. 77 0. 22	2. 14 0. 85 1. 12 1. 07	0. 23 12. 45 0. 07 2. 85		. 0. 1
College Station	Brazos	0.30 T.		2. 14 0. 85 1. 12 1. 07	0. 23 12. 45 0. 07 2. 85 1. 00		:  î.c
College Station Copperas Cove Catesville	Milam Brazos Coryell do Williamson	0.30 T.	0. 01 0. 77 0. 22 0. 06	2. 14 0. 85 1. 12	0. 23 12. 45 0. 07 2. 85 1. 00	1. 43	1.0 15.1
College Station Copperas Cove	Brazos Coryelldo Williamson	T. 0.30 T.	0,06	2. 14 0. 85 1. 12 1. 07	0. 23 12. 45 0. 07 2. 85 1. 00 13. 00	1. 43	1.0 15.1 0.0
College Station Copperas Cove. Gatesville Georgetown Hamilton Hompstead	Milam. Brazos Coryell. do. Williamson Hamilton Waller	T. 0.30 T.	0, 06	2. 14 0. 85 1. 12 1. 07 0. 70	0. 23 12. 45 0. 07 2. 85 1. 00 13. 00 0. 06 1. 10	1.43	1.0 15.1 0.0 1.3
College Station Copperas Cove. Gatesville Georgetown Hamilton Hompstead Lampasns Navasota	Milam. Brazos Coryell	T. 0.30 T. T.	0, 06 0, 50 0, 55	2. 14 0. 85 1. 12 1. 07 0. 70 0. 77 0. 03	0. 23 12. 45 0. 07 2. 85 1. 00 13. 00	1.43	1.0 15.1 0.0 1.3 3.3
College Station Copperas Cove. Gatesville Georgetown Hamilton Hempstead Lampasas Navasota. Rosenberg	Milam. Brazos. Coryell. do. Williamson. Hamilton. Waller. Lampasas. Grimes. Fort Bend	T. 0.30 T. T.	0.06 0.50 0.55 2.00	2. 14 0. 85 1. 12 1. 07 0. 70 0. 77 0. 03	0. 23 12. 45 0. 07 2. 85 1. 00 13. 00 0. 06 1. 10 0. 53	1.43	1.0 15.1 0.0 1.3 3.3 1.0
College Station Copperas Cove Gatesville Georgetown Hamilton Hempstead Lampasas Navasota Rogenherg	Mism. Brazos Coryell do. Williamson Hamilton Waller Lampasas Grimes Fort Bend Austin	T. 0.30 T. T. 0.40 0.05	0, 06 0, 50 0, 55	2. 14 0. 85 1. 12 1. 07 0. 70 0. 77 0. 03	0. 23 12. 45 0. 07 2. 85 1. 00 13. 00 0. 06 1. 10 0. 53	1.43	1.0 15.1 0.0 1.3 3.3 1.0
College Station Copperas Cove. Gatesville Georgetown Hamilton Hemnstead Lampasas Navasota. Rogenberg	Milam. Brazos. Coryelldo. Williamson. Hamilton. Waller Lampasas. Grimes. Fort Bend Austia. Burleson.	T. 0.30 T. T. 1.50 0.40 0.05	0, 06 0, 50 0, 55 2, 00 0, 50	2. 14 0. 85 1. 12 1. 07 0. 70 0. 77 0. 03 1. 22 0. 93 0. 30	0. 23 12. 45 0. 07 2. 85 1. 00 13. 00 0. 06 1. 10 0. 53	1. 43 0. 00 0. 70	1.0 15.1 0.0 1.3 3.3 1.0 3.6
College Station Copperas Cove Gatesville Georgetown Hamilton Hemnistead Lampasas Navasota Rosenberg Sealy Somerville	Mism. Brazos. Coryell. do. Williamson. Hamilton. Waller. Lampasas. Grimes. Fort Bend. Austin. Burleson.	T. 0.30 T. T. 1.50 0.40 0.05 0.25	0. 06 0. 50 0. 55 2. 00 0. 50	2. 14 0. 85 1. 12 1. 07 0. 70 0. 77 0. 03 1. 22 0. 33 0. 30 0. 18	0. 23 12. 45 0. 07 2. 85 1. 00 13. 00 0. 06 1. 10 0. 53	1. 43	1.0 15.1 0.0 1.3 3.3 1.0 1.4
College Station Copperas Cove Gatesville Georgetown Hamilton Hempstead Lampasas Navasota. Rozenberg. Sealy Somerville Sugarland	Mism. Brazos. Coryell. do. Williamson Hamilton Waller Lampasas. Grimes. Fort Bend Austin Burleson Fort Bend Williamson Bell	T. 0.30 T. 1.50 0.40 0.05 0.25 0.04	0, 06 0, 50 0, 55 2, 00 0, 50	2. 14 0. 85 1. 12 1. 07 0. 70 0. 77 0. 03 1. 22 0. 33 0. 30 0. 18	0. 23 12. 45 0. 07 2. 85 1. 00 13. 00 0. 06 1. 10 0. 53	1. 43	1.0 15.1 0.0 1.3 3.3 1.6 0.8 2.6 24.4
College Station Copperas Cove Catesville Georgetown Hamilton Hemnistead Lampasss Navasota Resenberg Celly Somerville Sugarland Taylor Temple	Mism. Brazos. Coryell. do Williamson. Hamilton. Waller Lampasas. Grimes. Fort Bend Austin Burleson. Fort Bend Williamson. Bell	T. 0.30 T. 1.50 0.40 0.05 0.25 0.04	0. 06 0. 50 0. 55 2. 00 0. 50	2. 14 0. 85 1. 12 1. 07 0. 70 0. 77 0. 03 1. 22 0. 93 0. 30	0. 23 12. 45 0. 07 2. 85 1. 00 13. 00 0. 06 1. 10 0. 53	1. 43 0. 00 0. 70 	1.0 15.1 0.0 1.3 3.3 1.6 0.8 2.6 24.4
College Station Copperas Cove Copperas Cove Gatesville Georgetown Hamilton Hempstead Lampasas Navasota. Rozenberg Scaly Somerville Sugarland Taylor Taylor Temple.	Mism. Brazos. Coryell. do Williamson. Hamilton. Waller Lampasas. Grimes. Fort Bend Austin Burleson. Fort Bend Williamson. Bell	T. 0.30 T. T. 1.50 0.40 0.05 0.04 0.04 0.04	0, 06 0, 50 0, 55 2, 00 0, 55 1, 95 0, 28	2. 14 0. 85 1. 12 1. 07 0. 70 0. 77 0. 03 1. 22 0. 33 0. 30 0. 18	0. 23 12. 45 0. 07 2. 85 1. 00 13. 00 0. 06 1. 10 0. 53	1. 43 0. 00 0. 70 	1.0 15.1 0.0 1.3 3.3 1.6 0.8 2.6 24.4
College Station Copperas Cove Catesville Georgetown Hamilton Hemustead Lampasas Navasota Rovenherg Sealy Somerville Sugarland Taylor Temple Valley Junction  Alice	Mism. Brazos. Coryell. do Williamson Hamilton Waller Lampasas. Grimes. Fort Bend Austin Burleson. Fort Bend Williamson Bell. Robertson.  7. COÁST DRA Jim Wells.	T. 0.30 T. 1.50 0.40 0.05 0.25 0.04 0.04	0. 06 0. 50 0. 55 2. 00 0. 50 1. 95 0. 28	2. 14 0. 85 1. 12 1. 07 0. 70 0. 77 0. 03 1. 22 0. 93 0. 30 0. 18 16. 11 0. 35 0. 25	0. 23 12. 45 0. 07 2. 85 1. 00 13. 00 0. 06 1. 10 0. 53 0. 50 0. 27 7. 87 9. 00 2. 00	1. 43 0. 00 0. 70 0. 18 2. 55 0. 32	1.0 15.1 10.0 1.3 3.3 1.6 1.6 1.6 2.6 24.4 11.6 2.5
College Station Copperas Cove Gatesville Georgetown Hamilton Hempstead Lampasas Navasota. Rozenberg. Scaly Somerville Sugarland Temple Valley Junction  Alice	Mism. Brazos. Coryelldo.  do. Williamson. Hamilton. Waller Lampasas. Grimes. Fort Bend Austin., Burleson. Fort Bend Williamson Bell. Robertson.  7. COÁST DRA	T. 0.30 T. 1.50 0.40 0.05 0.04 0.04 0.04 0.04 0.04 0	0. 06 0. 50 0. 55 2. 00 0. 50 1. 95 0. 28	2. 14 0. 85 1. 12 1. 07 0. 70 0. 77 0. 03 1. 22 0. 93 0. 18 16. 11 0. 35 0. 25	0. 23 12. 45 0. 07 2. 85 1. 00 13. 00 0. 06 1. 10 0. 53 0. 53 0. 57 9. 00 2. 00	1. 43 0. 00 0. 70 0. 18 2. 55 0. 32	15.0 15.0 10.0 1.3 3.3 1.4 0.8 24.4 11.4 24.4 11.8
College Station Copperas Cove Gatesville Georgetown Hamilton Hemustead Lampasss Navasota Recepter Somerville Somerville Sugarland Taylor Temple Valley Junction  Alice Alvin Angleton	Mism. Brazos. Coryell. do Williamson Hamilton Waller Lampasas. Grimes. Fort Bend Austin Burleson Fort Bend Williamson Bell. Robertson.  7. COÁST DRA  Jim Wells Brazoria	T. 0.30 T. 1.50 0.40 0.05 0.25 0.04 0.04	0. 06 0. 50 0. 55 2. 00 0. 50 1. 98 0. 28	2. 14 0. 85 1. 12 1. 07 0. 70 0. 77 0. 03 1. 22 0. 93 0. 18 16. 11 1. 0. 25 0. 25	0. 22 12. 45 0. 07 2. 85 1. 00 0. 06 1. 10 0. 53 0. 50 0. 27 7. 87 9. 00 2. 00	1. 43 0. 00 0. 70 0. 18 2. 55 0. 32	1.0 10.0 1.3 3.3 1.0 0.8 2.0 21.4 11.8
College Station Copperas Cove Caperas Cove Catesville Georgetown Hamilton Hempstead Lampasas Navasola Rosenberg. Sealy Somerville Sugarland. Taylor Temple Valley Junction  Alice Alvin Angleton Angleton	Mism. Brazos. Coryell. do Williamson Hamilton Waller Lampasas. Grimes. Fort Bend Austin Burleson Fort Bend Williamson Bell. Robertson.  7. COÁST DRA  Jim Wells Brazoria	T. 0.30 T. 1.50 0.40 0.05 0.25 0.04 0.04	0. 06 0. 50 0. 55 2. 00 0. 50 1. 98 0. 28	2. 14 0. 85 1. 12 1. 07 0. 77 0. 73 1. 22 0. 93 0. 30 0. 18 16. 11 0. 35 0. 25	0. 22 12. 45 0. 07 2. 85 1. 00 0. 06 1. 10 0. 53 0. 50 0. 27 7. 87 9. 00 2. 00	1. 43 0. 00 0. 70 0. 18 2. 55 0. 32	3. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.
College Station Copperas Cove Copperas Cove Catesville Georgetown Hamilton Hempstead Lampasas Navasota Rozenberg Scaly Somerville Singarland Traylor Temple Valley Junction  Alice Alvin Angleton Austwell Heeville	Mism. Brazos. Coryell. do Williamson Hamilton Waller Lampasas. Grimes. Fort Bend Austin Burleson Fort Bend Williamson Bell. Robertson.  7. COÁST DRA  Jim Wells Brazoria	T. 0.30 T. 1.50 0.40 0.05 0.25 0.04 0.04	0. 06 0. 50 0. 55 2. 00 0. 55 2. 00 0. 28 1. 96 0. 28 4. 90 1. 12 1. 72 2. 20	2. 14 0. 85 1. 12 1. 07 0. 77 0. 73 1. 22 0. 93 0. 18 16. 11 1. 25 0. 08 0. 18 0. 18 0. 18 1. 25 0. 25	0. 22 12. 45 0. 07 2. 85 1. 00 13. 00 0. 06 1. 10 0. 53  0. 50 0. 20 2. 00 2. 00 2. 00 2. 00	1. 43 0. 00 0. 70 0. 18 2. 55 0. 32	1.0 15.1 0.0 1.3 3.6 1.4 2.6 11.8 2.6 10.8 1.8 2.9
Hempstead Lampass Navasota Rozenberg Sealy Somerville Sugarland Temple Valley Junction  Alice Alvin Angleton Anstwell Beeville Corpus Christi	Mism. Brazos. Coryelldodo. Williamson. Hamilton. Waller Lampasas. Grimes. Fort Bend. Austin. Burleson. Fort Bend. Williamson Bell. Robertson.  7. COÁST DRA  Jim Wells. Brazoriado. Refugio. Bee.	T. 0.30 T. 1.50 0.40 0.40 0.05 0.25 0.04 0.04	0. 06 0. 50 0. 55 2. 00 0. 50 1. 95 0. 28 0. 28 1. 12 1. 76 2. 20 0. 81	2. 14 0. 85 1. 12 1. 07 0. 77 0. 73 1. 22 0. 93 0. 18 16. 11 1. 25 0. 08 0. 18 0. 18 0. 18 1. 25 0. 25	0. 22 12. 45 0. 07 2. 85 1. 00 13. 00 0. 06 1. 10 0. 53  0. 50 0. 20 2. 00 2. 00 2. 00 2. 00	1. 43 0. 00 0. 70 0. 18 2. 55 0. 32	1.0 15.1 0.0 1.3 1.6 1.6 2.6 2.6 2.6 10.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1
College Station Copperas Cove. Gatesville Georgetown Hamilton Hemnistead Lampasas Navasota. Rosenberg Scaly Somerville Sugarland Taylor Temple Valley Junction  Alice Alvin Angleton Austwell Heeville Corpus Christi. Danevang	Mism. Brazos. Coryelldodo. Williamson. Hamilton. Waller Lampasas. Grimes. Fort Bend. Austin. Burleson. Fort Bend. Williamson Bell. Robertson.  7. COÁST DRA  Jim Wells. Brazoriado. Refugio. Bee.	T. 0.30 T. 1.50 0.40 0.40 0.05 0.25 0.04 0.04	0. 06 0. 50 0. 55 2. 00 0. 55 2. 00 0. 28 1. 96 0. 28 4. 90 1. 12 1. 72 2. 20	2. 14 0. 85 1. 12 1. 07 0. 77 0. 73 1. 22 0. 93 0. 18 16. 11 1. 25 0. 08 0. 18 0. 18 0. 18 1. 25 0. 25	0. 22 12. 45 0. 07 2. 85 1. 00 13. 00 0. 06 1. 10 0. 53  0. 50 0. 20 2. 00 2. 00 2. 00 2. 00	1. 43 0. 00 0. 70 0. 18 2. 55 0. 32	1.0 15.1 0.0 1.3 3.1 2.0 2.4 4.1 1.8 2.6 2.6 2.6 4.2 4.4 2.7 4.4 2.7 4.4 2.7 4.4 4.8 4.8 4.8 4.8 4.8 4.8 4.8 4.8 4.8
College Station Copperas Cove Copperas Cove Gatesville Georzetown Hamilton Hempstead Lampasas Navasola Rosenberg. Sealy. Somerville Sugarland Taylor Temple Valley Junction  Alice Alvin Angleton Austwell Heeville Danevang Edna Edna Edna Edna	Mism. Brazos. Coryelldo. Williamson. Hamilton. Waller Lampasas. Grimes. Fort Bend Austlu., Burleson. Fort Bend Williamson Bell. Robertson.  7. COÁST DRA  Jim Wells. Brazoriado. Refugio. Bee Nuces. Wharton. Jackson. Brooks.	T	0. 06 0. 50 2. 00 0. 55 2. 00 0. 50 1. 95 0. 28 4. 90 1. 12 1. 76 2. 20 0. 84 2. 95 2. 63	2. 14 0. 85 1. 12 1. 07 0. 77 0. 73 1. 22 0. 93 0. 18 16. 11 1. 25 0. 08 0. 18 0. 18 0. 18 1. 25 0. 25	0. 22 12. 45 0. 07 2. 85 1. 00 13. 00 0. 06 1. 10 0. 53  0. 50 0. 20 2. 00 2. 00 2. 00 2. 00	1. 43 0. 00 0. 70 0. 18 2. 55 0. 32 0. 08	1.0 15.1 0.0 1.3 3.3 1.4 0.8 2.6 2.6 2.6 2.6 2.6 2.6 2.6 2.6 2.6 2.6
College Station Copperas Cove Gatesville Georgetown Hamilton Hemistead Lampassas Navasota Recemberg Fealy Somerville Sugarland Taylor Temple Valley Junction  Alice Alvin Austeon Austwell Heeville Corpus Christi Danevang Edna Faffurrias Halletisville	Mism. Brazos. Coryelldo. Williamson Hamilton. Waller Lampasas. Grimes. Fort Bend Austin. Burleson. Fort Bend Williamson Bell. Robertson.  7. COAST DRA  Jim Wells. BrazoriadoRefugio. Bee Nueces. Wharton. Jackson Brooks.	T	0. 06 0. 50 0. 55 2. 00 0. 50 1. 96 0. 28 1. 18 4. 90 1. 12 1. 76 2. 20 0. 84 2. 95 0. 98	2.14 0.85 1.12 1.07 0.70 0.77 0.03 1.22 0.93 0.18 1.03 0.18 0.18 0.18 1.45 1.50 0.70 1.45 1.50 1.50 1.50 1.50 1.50 1.50 1.50 1.5	0. 22 12. 45 0. 07 2. 85 1. 00 13. 00 0. 06 1. 10 0. 53  0. 50 0. 20 2. 00 2. 00 2. 00 2. 00	1. 43 0. 00 0. 70 0. 18 2. 55 0. 32 0. 08	1.0 15.1 0.0 1.3 3.3 1.4 0.8 24.4 11.8 1.8 1.8 2.8 2.8 2.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1
College Station Copperas Cove Copperas Corpus Christi. Danevang Failurrias Hallettsville La Parra	Mism. Brazos. Coryelldo. Williamson Hamilton. Waller Lampasas. Grimes. Fort Bend Austin. Burleson. Fort Bend Williamson Bell. Robertson.  7. COAST DRA  Jim Wells. BrazoriadoRefugio. Bee Nueces. Wharton. Jackson Brooks.	T	0. 06 0. 50 0. 55 2. 00 0. 50 1. 96 0. 28 1. 18 4. 90 1. 12 1. 76 2. 20 0. 84 2. 95 0. 98	2. 14 0. 85 1. 12 1. 1. 27 0. 70 0. 77 0. 03 0. 18 1. 22 0. 93 0. 18 16. 11 0. 18 3. 40 0. 18 3. 40 0. 18 0. 13 0. 18 1. 45 1. 5 1. 5 1. 5 1. 5 1. 5 1. 5 1. 5 1.	0. 22 12. 45 0. 07 2. 85 1. 30 0. 06 1. 10 0. 53 0. 27 7. 8. 70 2. 00 2.	0.18 2.55 0.08	1.0 15.1 0.0 1.3 3.3 1.4 0.8 2.4 4.1 1.9 2.6 2.6 2.6 2.6 2.6 2.6 2.6 2.6 2.6 2.6
College Station Copperas Cove. Gatesville Georgetown Hamilton Hemnistead Lampasas Navasota. Rosenberg caly Somerville Sugarland Paylor Temple Valley Junction  Alice Alvin Angleton Austwell Beeville Corpus Christi. Danevang Edna Falfurias Hallettsville La Parra Matagorda	Mism. Brazos. Coryelldo. Williamson Hamilton. Waller Lampasas. Grimes. Fort Bend Austin. Burleson. Fort Bend Williamson Bell. Robertson.  7. COAST DRA  Jim Wells. BrazoriadoRefugio. Bee Nueces. Wharton. Jackson Brooks.	T	0. 06 0. 50 0. 55 2. 00 0. 50 1. 96 0. 28 1. 18 4. 90 1. 12 1. 76 2. 20 0. 84 2. 95 0. 98	2.14 0.85 1.12 1.07 0.77 0.03 1.22 0.33 0.30 0.18 0.18 0.13 0.13 0.14 0.15 0.77 0.78	0. 22 12. 45 0. 07 2. 85 1. 00 13. 00 0. 06 1. 10 0. 53  0. 50 0. 20 2. 00 2. 00 2. 00 2. 00	0.18 2.55 0.08	3.3 3.3 1.4 0.8 24.4 11.5 2.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1
College Station Copperas Cove Copperas Copp	Mism. Brazos. Coryelldo. Williamson Hamilton. Waller Lampasas. Grimes. Fort Bend Austin. Burleson. Fort Bend Williamson Bell. Robertson.  7. COAST DRA  Jim Wells. BrazoriadoRefugio. Bee Nueces. Wharton. Jackson Brooks.	T	0. 06 0. 50 0. 55 2. 00 0. 50 1. 96 0. 28 1. 18 4. 90 1. 12 1. 76 2. 20 0. 84 2. 95 0. 98	2.14 0.85 1.12 1.07 0.70 0.77 0.03 1.22 0.93 0.30 0.30 0.18 1.12 1.03 1.03 1.03 1.03 1.03 1.03 1.03 1.03	0.22 12.45 0.07 2.85 1.00 13.00 0.06 1.10 0.53 0.53 0.53 0.53 0.53 0.53 0.60 7.87 9.00 2.00	0.18 2.55 0.38	1.0 15.1 0.0 1.3 3.3 3.3 1.6 0.8 2.4 4.4 1.8 2.6 2.4 2.7 4.4 2.7 4.4 2.7 4.4 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0
College Station Copperas Cove. Gatesville Georgetown Hamilton Hemnistead Lampasas Navasota. Rosenberg caly Somerville Sugarland Paylor Temple Valley Junction  Alice Alvin Angleton Austwell Beeville Corpus Christi. Danevang Edna Falfurias Hallettsville La Parra Matagorda	Mism. Brazos. Coryelldo. Williamson Hamilton. Waller Lampasas. Grimes. Fort Bend Austin. Burleson. Fort Bend Williamson Bell. Robertson.  7. COAST DRA  Jim Wells. BrazoriadoRefugio. Bee Nueces. Wharton. Jackson Brooks. Lavaca. Kenedy. Matagorda	T	0. 06 0. 50 0. 55 2. 00 0. 50 1. 96 0. 28 1. 18 4. 90 1. 12 1. 76 2. 20 0. 84 2. 95 0. 98	2.14 0.85 1.12 1.07 0.70 0.77 0.03 1.22 0.93 0.30 0.18 1.03 0.25 1.25 0.77 0.78 1.15 0.78 1.15 0.78 1.15 0.78	0.22 12.45 0.07 2.85 1.00 13.00 0.06 1.10 0.53 0.53 0.53 0.53 0.53 0.53 0.60 7.87 9.00 2.00	0.18 2.55 0.32	3.3 3.3 1.4 0.8 24.4 11.5 2.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1

Table 2.—Total rainfall, San Antonio and vicinity, September 8-10, inclusive, 1921. (See fig. 1, p. 495, this Review.)

	Inches.		Inches.
No. 1	15.00	No. 7	13.00
No. 2	17.50	No. 8	13. 18
No. 3	20.00	No. 9 12.00 to	15.00
No. 4	18.00	No. 10	8. 55
No. 5	21.00	No. 11	9.50
No. 6	. 15.00	No. 12	6.84

There were standard rain-gages at Nos. 7, 8, 10, 11 and 12, and improvised gages at Nos. 1, 2, 3, 4, 5, 6, and 9. The figures for station No. 5 are not considered to be reliable, although there was a standard rain-gage.

reliable, although there was a standard rain-gage.

The reader is referred for detailed reports of the Texas floods to the articles by Messrs. Bunnemeyer, Jarboe, and McAuliffe, pages 491-497, this Review.

### OTHER FLOODS.

There were several rises during the first half of the month in the interior rivers of Indiana and Missouri, but they were inconsequential, although as a whole justifying the warnings that were issued. The value of warnings of minor rises, even though high stages are not expected, is shown by the following extract from a report by Mr. M. W. Hayes, Meteorologist, in charge of the Weather Bureau office at St. Louis, Mo.:

At 7 a. m., September 5, the stage of the Mississippi at St. Louis was 4.8 feet. After the receipt of the 7 a. m. reports from upstream a rise of 6 feet, to occur by noon of the 6th, was forecast. The 5th was a holiday, and every effort was made to give the forecast the widest possible dissemination by telephone, as well as through the afternoon newspapers. The efforts seemed to have been successful, as the river banks were cleared of all property likely to be damaged or destroyed by water, the wharf-boats were pulled in, and engineering work at and below St. Louis was put in a condition to meet the rise. At 12 noon, September 6, the stage was 10.8 feet.

Flood stages during the month of September, 1921.

River.	Station.	Flood stage.	Above flood stages—dates.		Crest.	
			From—	То	Stage.	Date.
Mississippi drainage, Des Moines West Gulf:	Ottumwa, Iowa	Feet. 10	17	18	Feet. 11.4	17
Brazos	(Valley Junction, Tex. (Washington, Tex (Hempstead, Tex	44 45 40	11 13 16	13 17 16	58. 2 50. 0 40. 2	12 14 16
Colorado	Austin, Tex Columbus, Tex Smithville, Tex	18 28 24	10 12 11	10 13 11	19.0 33.8 26.0	10 13 11
Guadalupe Rio Grande	{Gonzales \Victoria, Tex Rio Grande City, Tex.	22 16 15	11 14 10	13 16 10	31.4 20.5 18.0	11 16 10

# MEAN LAKE LEVELS DURING SEPTEMBER, 1921.

By United States Lake Survey.
[Detroit, Mich., October 5, 1921.]

The following data are reported in the "Notice to Mariners" of the above date:

	Lakes.1				
Data.	Superior.	Michigan and Huron.	Erie.	Ontario.	
Above mean sea level at New York.	Feet. 602, 67	Feet. 580. 04	Feet. 572.17	Feet. 245. 43	
Above or below— Mean stage of August, 1927 Mean stage of September, 1920	-0.10 -0.14	-0.14 -0.83	-0.32 $-0.22$	0, 50 0, 04	
Average stage for September, last 10 years	-0.05	-0.68	-0.27	-0.74	
Highest recorded September stage	-1.41	-3.39	-1.77	-2.18	
Lowest recorded September stage	+1.18	+0.38	+0.89	+1.43	
August level.		-0.20	0, 20	0. 30	
October level		+0.20	+0.30	+0.50	

<sup>1</sup> Lake St. Clair's level: In September, 574.99 feet.

# EFFECT OF WEATHER ON CROPS AND FARMING OPERATIONS: SEPTEMBER, 1921.

By J. WARREN SMITH, Meteorologist.

Warm weather for the season was the rule throughout September in all sections of the country, except the far Northwest and parts of the West, and no extensive frost damage was experienced. Freezing temperatures were frequent in the far Northwest, but the cool waves dissipated rapidly in their eastward and southward progress, and freezing weather was confined to the northern Rocky Mountain and northern Plateau districts, the northwestern Great Plains, and in a few localities of the interior of the Northeast. There was some damage by low temperatures in the Northwest, where it was too cool for the proper development of late crops, but the staple crops had largely matured and were not harmed to any great extent.

Farm work was considerably interrupted by rain in the interior Northern States, and during part of the month in some southwestern localities; otherwise the weather was favorable for outdoor operations, and farm

work made generally good progress.

Corn matured rapidly with warm weather and considerable sunshine. Most of it was beyond frost danger in Ohio, northern Illinois, Iowa, Missouri, and Nebraska by the middle of the month. Considerable harm was done, however, by molding, sprouting, and rotting in portions of the upper Mississippi Valley by continued wet weather and high temperatures during the latter part of the month, and drying weather was badly needed in all of the central Mississippi Valley States. Late corn

needed rain in the Southern States, but the harvest of the early crop made good progress.

There was little or no improvement in cotton during the month. The weather was mostly warm and dry, although considerable damage resulted from excessive rains in central and southwestern Texas at the close of the first decade. The continued hot, dry weather was unfavorable in the eastern portions of the belt where plants lost vigor and shed badly in most places. Very little or no top crop was reported from any section of the belt. Cotton bolls opened very rapidly, and picking and ginning made good progress. At the close of the month picking was well advanced in Texas, while the crop had practically all been gathered in the southern half of Georgia, most sections of Florida, and in many localities in southern Alabama. Weevil activity continued marked, with a further spread toward the northeastern limits of the belt.

The weather was favorable for harvesting late grains, and for thrashing, in the late northwestern districts. During the first half of the month the soil was mostly in good condition for preparation for seeding throughout the principal grain-growing States. Seeding made rather slow progress, however, in the interior valleys the latter part of the month, on account of frequent rains and wet soil, but rapid advance was made in the Great Plains States; this work was begun later than the average in most sections.